



Mark Scheme (Results)

January 2025

Pearson Edexcel International Advanced
Subsidiary Level In Chemistry (WCH11)
Paper 01 Structure, Bonding and Introduction
to Organic Chemistry

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January 2025

Question Paper Log Number P78455A

Publications Code WCH11_01_2501_MS

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

() means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities. Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Section A

Question Number	Answer	Mark
1	The only correct answer is B (3.6×10^{23}) <i>A is incorrect because this is the number of molecules of carbon dioxide in 8.8 g</i> <i>C is incorrect because this is the number of molecules of carbon dioxide in 88 g</i> <i>D is incorrect because this is the number of atoms of carbon dioxide in 88 g</i>	(1)

Question Number	Answer	Mark
2	The only correct answer is C (0.0060 mol) <i>A is incorrect because this is the number of moles of magnesium nitrate in the solution</i> <i>B is incorrect because this would be correct if the formula of magnesium nitrate was MgNO_3</i> <i>D is incorrect because this is the number of ions that would be present if there were two magnesium ions and two nitrate ions in each magnesium nitrate</i>	(1)

Question Number	Answer	Mark
3	The only correct answer is C (1.6605×10^{-24}) <i>A is incorrect because this is the mass of a water molecule derived from mass numbers $\div$ by the mass in g instead of $\times$ mass in g</i> <i>B is incorrect because this is the mass of a water molecule in amu $\div$ by the mass in g instead of $\times$ mass in g</i> <i>D is incorrect because this is using the mass numbers rather than the relative isotopic masses</i>	(1)

Question Number	Answer	Mark
4	The only correct answer is B (92) <i>A is incorrect because this is the molecular mass of NO₄ which has 82.05% oxygen</i> <i>C is incorrect because this is the molecular mass of N₃O₄ which has 60.38% oxygen</i> <i>D is incorrect because this is $69.57 \div 64 \times 100$ instead of $64 \div (69.57 \div 100)$</i>	(1)

Question Number	Answer	Mark
5	The only correct answer is C (10.0 cm³ of 0.90 mol dm⁻³ magnesium chloride solution) <i>A is incorrect because this solution contains 0.012 mol of chloride ions</i> <i>B is incorrect because this solution contains 0.012 mol of chloride ions</i> <i>D is incorrect because this solution contains 0.012 mol of chloride ions</i>	(1)

Question Number	Answer	Mark
6	The only correct answer is C (0.095 g) <i>A is incorrect because this has been divided by 1000 not 1000000</i> <i>B is incorrect because this is ten times too big</i> <i>D is incorrect because this is the mass of the solute in kg instead of g</i>	(1)

Question Number	Answer	Mark
7	The only correct answer is B ($\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$) <i>A is incorrect because this has a percentage by mass of water of 57%</i> <i>C is incorrect because this has a percentage by mass of water of 27%</i> <i>D is incorrect because this has a percentage by mass of water of 16%</i>	(1)

Question Number	Answer	Mark
8	The only correct answer is D (87%) <i>A is incorrect because this is the atom economy of water</i> <i>B is incorrect because this is the economy by moles rather than by mass</i> <i>C is incorrect because this is the value ignoring the stoichiometry (balancing) of the equation for the products</i>	(1)

Question Number	Answer	Mark
9	The only correct answer is B (579 1979 2963 6200) <i>A is incorrect because there is a large jump between 3rd and 4th ionisation energy, so Group 3, but lower first ionisation energy than B so lower in the group</i> <i>C is incorrect because there is not a relatively large jump between the 3rd and 4th ionisation energies</i> <i>D is incorrect because there is not a relatively large jump between the 3rd and 4th ionisation energies</i>	(1)

Question Number	Answer	Mark
10	The only correct answer is D (sulfur molecules have more electrons than phosphorus molecules) <i>A is incorrect because there is no electronegativity difference so no dipole in sulfur or phosphorus</i> <i>B is incorrect because the covalent bonds do not break during melting, only intermolecular forces between simple molecular structures are broken</i> <i>C is incorrect because sulfur has a simple molecular structure, S₈</i>	(1)

Question Number	Answer	Mark
11	The only correct answer is A ($K^+ < Ar < Cl^- < Br^-$) <i>B is incorrect because potassium ion is the smallest as it is isoelectronic with Ar and Cl^- and has the most protons</i> <i>C is incorrect because bromide ion has one more shell of electrons than the others so is the largest</i> <i>D is incorrect because bromide ion has one more shell of electrons than the others so is the largest</i>	(1)

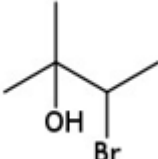
Question Number	Answer	Mark
12	The only correct answer is A (small large) <i>B is incorrect because the ion needs a large charge</i> <i>C is incorrect because the ion needs a small radius and a large charge</i> <i>D is incorrect because the ion needs a small radius</i>	(1)

Question Number	Answer	Mark
13	The only correct answer is B (PCl_3F_2) <i>A is incorrect because this is not symmetrical so must have a dipole</i> <i>C is incorrect because this is not symmetrical as the central equatorial chlorines are asymmetrical so must have a dipole</i> <i>D is incorrect because this is not symmetrical so must have a dipole</i>	(1)

Question Number	Answer	Mark
14	The only correct answer is A () <i>B is incorrect because hexane is not an oxidising agent</i> <i>C is incorrect because hexane is not corrosive</i> <i>D is incorrect because hexane is not toxic</i>	(1)

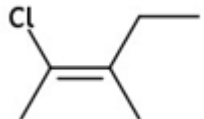
Question Number	Answer	Mark
15	The only correct answer is B (3,4-dimethyldecane) <i>A is incorrect because the longest chain has 10 carbons so it is a decane</i> <i>C is incorrect because the longest chain has 10 carbons so it is a decane</i> <i>D is incorrect because the numbering of the substituents must give the lowest numbers</i>	(1)

Question Number	Answer	Mark
16	The only correct answer is D (decreases the average number of carbon atoms per molecule) <i>A is incorrect because cracking converts alkanes into smaller alkanes and alkenes</i> <i>B is incorrect because this is fractional distillation</i> <i>C is incorrect because cracking converts alkanes into smaller alkanes and alkenes</i>	(1)

Question Number	Answer	Mark
17	The only correct answer is A () <i>B is incorrect because this is the minor product of the addition of BrOH to 2-methylbut-2-ene</i> <i>C is incorrect because this is the major product of the addition of BrOH to 2-methylbut-1-ene</i> <i>D is incorrect because this is the minor product of the addition of BrOH to 2-methylbut-1-ene</i>	(1)

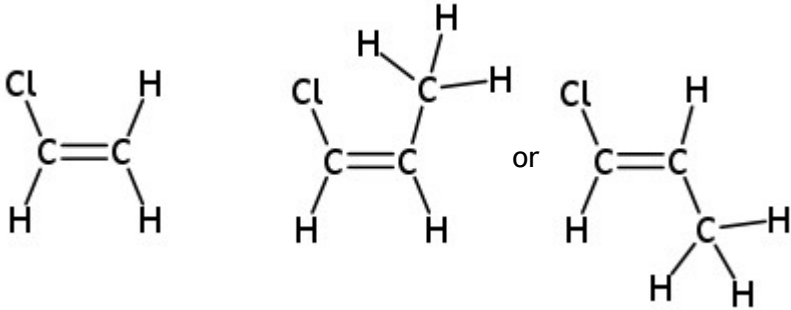
Question Number	Answer	Mark
18	The only correct answer is D ((i), (ii) and (iii)) <i>A is incorrect because all three are true</i> <i>B is incorrect because all three are true</i> <i>C is incorrect because all three are true</i>	(1)

Question Number	Answer	Mark
19	The only correct answer is B (4π and 38σ) <i>A is incorrect because there are 38 σ bonds and discounts C–H bonds attached to carbons in the C=C bonds</i> <i>C is incorrect because this counts the double bonds as two π bonds</i> <i>D is incorrect because this counts the double bonds as two π bonds not one π bond and one σ bond</i>	(1)

Question Number	Answer	Mark
20	The only correct answer is D () <i>A is incorrect because the chlorine on C1 and the methyl on C2 are highest priority so E-</i> <i>B is incorrect because the chlorine on C1 and the ethyl on C2 are highest priority so E-</i> <i>C is incorrect because the bromine on C1 and the chlorine on C2 are highest priority so E-</i>	(1)

TOTAL FOR SECTION A = 20 MARKS

Section B

Question Number	Answer	Additional Guidance	Mark
21(a)(i)	- displayed formula of chloroethene (1) - displayed formula of either isomer of 1-chloropropene (1)	 chloroethene 1-chloropropene Allow the methyl group to be condensed to CH₃ Ignore incorrect connectivity to CH₃ Ignore labels identifying geometric isomers (<i>E</i>-, <i>Z</i>-, <i>cis</i>-, <i>trans</i>-) even if incorrect Penalise non-displayed formulae once only	(2)

Question Number	Answer	Additional Guidance	Mark
21(a)(ii)	An explanation that makes reference to two of the following points: (because they) • have the same functional group(s) • have similar chemical properties • have the same general formula / $C_n H_{2n-1} Cl$ • differ from each other by a $-CH_2-$ group	Penalise reference to molecules for atoms / groups once only in (a)(ii) and (a)(iii) (1) Allow they are both alkenes / chloroalkenes / they both contain $C=C$ / chlorine (1) Allow same chemical properties (1) Do not award same empirical / molecular formula Do not award an incorrect general formula (1) Do not award $-CH_2-$ molecule	(2)

Question Number	Answer	Additional Guidance	Mark
21(a)(iii)	An explanation that makes reference to the following points: • (because there is) restricted rotation around the $C=C$ / carbon to carbon double bond (in both molecules) • (and) 1-chloropropene has two different groups on each of the carbons (in the double bond) • (but) there are two hydrogen (atoms) / same atoms on one carbon of chloroethene	Allow no rotation around the $C=C$ Allow 1-chloropropene has a Cl and a H on one carbon and a H and a CH_3 on the other carbon Allow reverse argument e.g. chloroethene does not have different groups (on one carbon) If M2 and M3 are not scored: award (1) for geometric isomers must have 2 different groups on each of the carbons May reference their diagrams in (a)(i)	(3)

Question Number	Answer	Additional Guidance	Mark
21(b)(i)	- formula showing $\text{CHCl}-\text{CH}(\text{CH}_3)$ - brackets and extension bonds and subscript n on the right	(1) Accept correct multiple repeat units Accept Cl and CH_3 on same side of C-C Ignore connectivity to CH_3 (1) Allow any type of bracket Allow N for n <u>Example of formula</u> $\left[\begin{array}{cc} \text{Cl} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{CH}_3 \end{array} \right]_n$	(2)

Question Number	Answer	Additional Guidance	Mark
21(b)(ii)	An answer that makes reference to two of the following points: - less dense / less weight - doesn't corrode / rust / oxidise - no metal (ions) get into the water supply	(1) Allow lower mass (1) Allow unreactive / does not react Allow long life of the piping means it does not need to be replaced Ignore non-biodegradable Do not award reference to "it is biodegradable" Do not award reference to erosion (1) Ignore pollution, keeps water clean Ignore references to cost of energy, recycling, production, insulation properties Ignore comparisons of sustainability / renewable resources even if incorrect	(2)

(Total for Question 21 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
22(a)	An answer that makes reference to the following point: to show that the electrons have opposite spin	Allow different spin Allow spin in different / opposite direction Award spin $+\frac{1}{2}$ and $-\frac{1}{2}$ Do not award spin/rotate around the nucleus in opposite direction Do not award references to attraction / positive charges	(1)

Question Number	Answer	Additional Guidance	Mark
22(b)	An explanation that makes reference to the following points: - some of the electrons are in an s sub-shell / orbital and some electrons are in the p sub-shell / orbital (they don't have the same energy because) electrons in p sub-shell / orbital have higher energy	Do not award s / p shell Accept reverse argument Allow mention of singular p orbital Do not award s / p shell Penalise use of s / p shell once only	(2)

Question Number	Answer	Additional Guidance	Mark
22(c)	An explanation that makes reference to the following points: • sphere / spherical	(1) Allow ball Do not award just circle / round Ignore diagrams	(1)

(Total for Question 22 = 4 marks)

Question Number	Answer	Additional Guidance	Mark
23(a)(i)	- calculation of abundance of 5th isotope (1) - expression for relative atomic mass (1) - calculation of x given to 2SF (1)	<u>Example of calculation</u> $100 - 20.5 - 7.8 - 36.5 - 7.8 = 27.4 (\%)$ $72.6 = \frac{(70 \times 20.5) + (73 \times 7.8) + (74 \times 36.5) + (76 \times 7.8) + (x \times 27.4)}{100}$ OR $72.6 = \frac{1435 + 569.4 + 2701 + 592.8 + (x \times 27.4)}{100}$ OR $72.6 = \frac{5298.2 + (x \times 27.4)}{100}$ Allow TE from M1 $x = \frac{7260 - 5298.2}{27.4} = 1961.8 \div 27.4 = 71.59 = 72$ Allow TE from M2 provided final answer is between 68 – 78 Correct answer with some working scores 3 Correct answer with no working scores 1	(3)

Question Number	Answer	Additional Guidance	Mark
23(a)(ii)	An answer that makes reference to the following point: the number of protons and neutrons / nucleons must be an integer / whole number	Ignore the values in the table with the least significant figures have 2 SF	(1)

Question Number	Answer	Additional Guidance	Mark
23(b)	An answer that makes reference to the following points: Similarity • (the atoms) have the same total / sum of the numbers of protons and of neutrons Difference • (an atom of) germanium(-76) has 2 fewer protons / (an atom of) selenium(-76) has 2 more protons • (an atom of) germanium(-76) has 2 more neutrons / (an atom of) selenium(-76) has 2 fewer neutrons • (an atom of) germanium(-76) has 2 fewer electrons / (an atom of) selenium(-76) has 2 more electrons	M2, M3 and M4 must be quantitative (1) Allow the atoms have the same mass number Allow germanium has 32 protons and selenium has 34 protons (1) Allow germanium has 44 neutrons and selenium has 42 neutrons (1) Allow germanium has 32 electrons and selenium has 34 electrons Allow germanium has 4 outer-shell electrons and selenium has 6 outer-shell electrons (1) If none of M2, M3 and M4 have been awarded allow 1 mark for two of the following: • germanium has more neutrons • germanium has fewer protons • selenium has more electrons Allow reverse argument(s)	(4)

(Total for Question 23 = 8 marks)

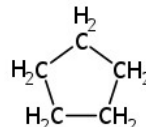
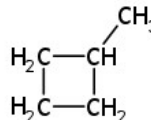
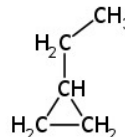
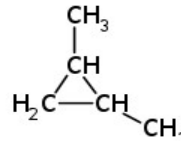
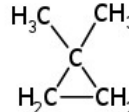
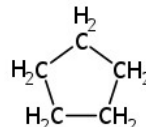
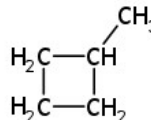
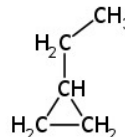
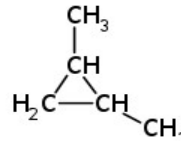
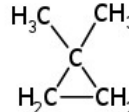
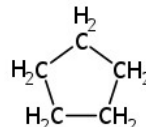
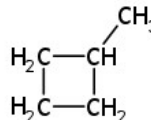
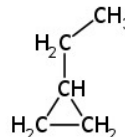
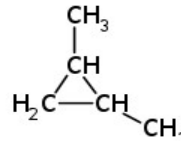
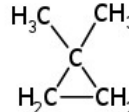
Question Number	Answer	Additional Guidance	Mark
24(a)(i) Clip all	- rearrangement of $pV = nRT$ (1) - conversion of dm^3 to m^3 (1) - substitution in correctly rearranged expression (1) - calculation of value of n (1)	<u>Example of calculation</u> $n = pV \div RT$ $V = 0.00179 / 1.79 \times 10^{-3}$ $n = (110\,000 \times 0.00179) \div (8.31 \times 473)$ Allow TE in M3 from incorrect conversion from dm^3 to m^3 $n = 0.0501 \text{ (mol)} / 5.01 \times 10^{-2} \text{ (mol)} / 0.050094 \text{ (mol)} / 5.0094 \times 10^{-2} \text{ (mol)} / 0.05 \text{ (mol)} / 5 \times 10^{-2} \text{ (mol)}$ Allow TE for M4 from incorrect values shown in a correctly rearranged expression Ignore SF throughout Correct answer with some working scores 4	(4)

Question Number	Answer	Additional Guidance	Mark
24(a)(ii)	calculation of M_r of X	<u>Example of calculation</u> $M_r = 3.5 \div 0.0500 = 70$ Accept 69.869 Allow TE on incorrect moles in (a)(i) provided answer >1	(1)

Question Number	Answer	Additional Guidance	Mark
24(a)(iii)	- calculation of moles of carbon and moles of hydrogen (1) - calculation of ratio and gives empirical formula (1)	<u>Example of calculation</u> $85.7 \div 12 = 7.1417$ and $14.3 \div 1 = 14.3$ $14.3 \div 7.1417 = 2.0023$ CH_2 Ignore SF throughout Correct answer with no working scores (2)	(2)

Question Number	Answer	Additional Guidance	Mark
24(a)(iv)	molecular formula	<u>Example of calculation</u> $\text{ans(a)(ii)} \div \text{ans(a)(iii)} \quad 70 \div 14 = 5$ C_5H_{10} Allow TE on (a)(ii) and (a)(iii) Answer with no working scores 1	(1)

Question Number	Answer	Additional Guidance	Mark
24(b)	An answer that makes reference to the following point: no (C=C) double bonds are present / molecule is not unsaturated / molecule is not an alkene / only single bonds are present / molecule is saturated / molecule is an alkane	Allow it is a cycloalkane Ignore it does not contain oxygen	(1)

Question Number	Answer	Additional Guidance	Mark						
24(c)	An answer that makes reference to the following points: - one possible structural isomer - a second structural isomer	<table><tr><td> OR cyclopentane </td><td> OR methylcyclobutane </td><td> OR ethylcyclopropane </td></tr><tr><td colspan="2"> OR 1,2-dimethylcyclopropane </td><td> OR 1,1-dimethylcyclopropane </td></tr></table> Allow any type of displayed or skeletal formulae Allow 1-methylcyclobutane and 1-ethylcyclopropane If name and formula are given, both must be correct Allow TE on formula from (a)(iv) If answer in (b) is alkene, then allow 1 mark for two correct alkenes using formula in (a)(iv)	 OR cyclopentane	 OR methylcyclobutane	 OR ethylcyclopropane	 OR 1,2-dimethylcyclopropane		 OR 1,1-dimethylcyclopropane	(2)
 OR cyclopentane	 OR methylcyclobutane	 OR ethylcyclopropane							
 OR 1,2-dimethylcyclopropane		 OR 1,1-dimethylcyclopropane							

(Total for Question 24 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
25(a)(i)	An answer that makes reference to the following point: (free) radical substitution	Ignore homolytic fission / homolysis Ignore halogenation	(1)

Question Number	Answer	Additional Guidance	Mark
25(a)(ii)	An answer that makes reference to the following point: ultraviolet / uv (radiation)	Allow uv light / sunlight Ignore references to temperature and pressure	(1)

Question Number	Answer	Additional Guidance	Mark
25(a)(iii)	An answer that makes reference to the following point: propagation		(1)

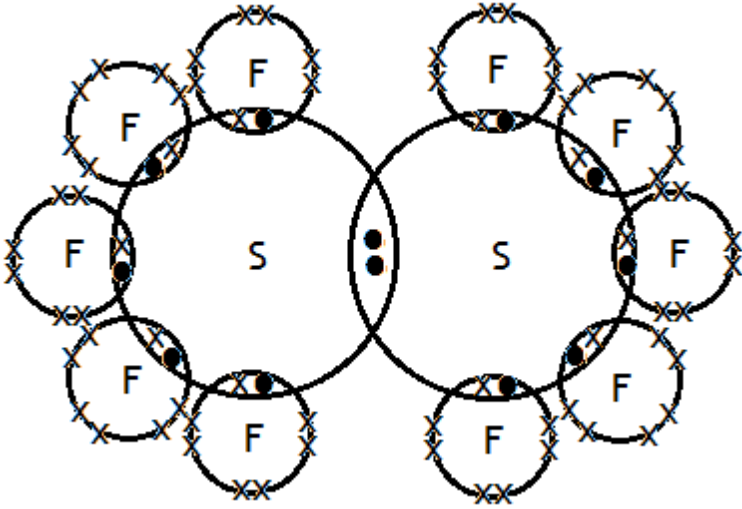
Question Number	Answer	Additional Guidance	Mark
25(a)(iv)	A description that makes reference to the following points: • It is a termination step (1) • two (free) radicals join together / react (to form a molecule and no other product / with no radical on the product side) (1) • one example of a termination step (by words or equation) (1) • a second example of a termination step (by words or equation) (1)	Possible termination steps include: $\text{CH}_3(\text{CH}_2)_3\bullet + \text{Cl}\bullet \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$ $2\text{Cl}\bullet \rightarrow \text{Cl}_2$ $2\text{CH}_3(\text{CH}_2)_3\bullet \rightarrow \text{CH}_3(\text{CH}_2)_6\text{CH}_3$ Allow termination steps involving products with more than one chlorine Ignore attempted initiation and propagation steps, overall substitution equation and correct further substitution in M3 and M4 Apply list principle for M3 and M4 only Do not award steps with $\text{H}\bullet$ Penalise omission of $\bullet$ once only	(4)

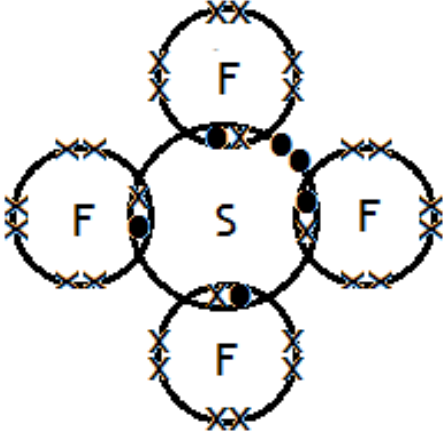
Question Number	Answer	Additional Guidance	Mark
25(b)(i)	An answer that makes reference to the following points: (A polar molecule is one in which) - one end / atom / region which is slightly positive and one which is slightly negative OR there is a dipole moment / charge separation OR the electron density / partial charge is concentrated around one end / atom / region / is unsymmetrical OR there is an electronegativity difference (between the atoms) (1) - chlorine (is not polar because it) has no electronegativity difference OR chlorine is symmetrical and so no slightly positive and slightly negative end OR no concentration of electron density OR no charge separation OR does not have a dipole moment OR only has one type of atom / element (1)	Do not award M1 if any references to ions or intermolecular forces Allow the shared pair (of electrons) is not equally shared Allow the shared pair (of electrons) is equally shared Do not award dipoles cancel / bonds cancel	(2)

Question Number	Answer	Additional Guidance	Mark
25(b)(ii)	An explanation that makes reference to the following points: • (the electrons in) the double bond / π-bond / C=C (of the alkene) (1) • repel electrons / distorts the electron cloud in the chlorine molecule / induces a dipole (1)	Allow making one chlorine atom (in the molecule) slightly positive / slightly charged Do not award references to free radicals / nucleophiles	(2)

(Total for Question 25 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
26(a)	An answer that makes reference to the following point: disulfur decafluoride	Allow disulfur(V) fluoride Ignore sulfur decafluoride Do not award fluorine for fluoride	(1)

Question Number	Answer	Additional Guidance	Mark
26(b)	2 dots in the S-S overlap (1) 10 pairs of one dot and one cross in the 10 S-F overlaps (1)	 Allow bonding electrons to touch / sit on the circles Any extra electron or electrons negates one of the marks	(2)

Question Number	Answer	Additional Guidance	Mark
26(c)	4 pairs of one dot and one cross in the S-F overlap (1) 1 pair of dots on the outer shell of sulfur and 3 pairs of crosses on the outer shell of each fluorine (1)	Example of dot-and-cross diagram  Allow two separate electrons for the sulfur lone pair Allow fluorine lone pairs shown as unpaired electrons Allow dots and crosses reversed	(2)

Question Number	Answer	Additional Guidance			Mark
26(d)	An answer that makes reference to the following points:				(4)
		Molecule	Diagram	F–S–F bond angle	
		SF ₆		90°	
	S₂F₁₀ shape with bonds as shown	(1)			
	S₂F₁₀ 90° for Do not award 120°	(1)			
	SF₄ shape with at least one dotted or wedged bond	(1)			
	SF₄ 90° / 180° and 120° Allow values 85–90° / 170–180° and 100–120°	(1)			
		Ignore lack of degree sign Ignore presence of a lone pair on S in SF ₄			

Question Number	Answer	Additional Guidance	Mark
26(e)	An answer that makes reference to the following points: • sulfur in SF₆ has six bonding pairs (of electrons) (and no lone pairs) (1) • sulfur in SF₄ has four bonding pairs (of electrons) and one lone pair (1) • the (electron) pairs repel to be as far away as possible / maximum separation (1)	Bonding pairs needs to be seen once only in the response Ignore references to individual shapes and bond angles, e.g., octahedral, tetrahedral, bipyramidal even if incorrect Allow the (electron) pairs move to minimise repulsion Do not award bonds repel Do not award repulsion of atoms	(3)

Question Number	Answer	Additional Guidance	Mark
26(f)	An answer that makes reference to the following points: • (SF₄ has) a lone pair of electrons on the sulfur (making SF₄ more reactive than SF₆) OR SF₄ is polar (because of its shape) (1) • (in S₂F₁₀) the S–S bond is weak compared to the S–F bond OR (in S₂F₁₀) the S–S bond is long compared to the S–F bonds (1) • SF₆ has (six) strong / difficult to break (S–F) bonds OR (the sulfur atom is small) so the six fluorine atoms hinder attack on the sulfur (1)	Allow the S–S bond requires less energy to break than an S–F bond Do not award S₂F₁₀ has lone pair(s) / is polar Allow SF₆ is octahedral and non-polar Allow the six fluorine atoms block the sulfur Ignore throughout references to intermolecular forces, free electrons, symmetry, polarity	(3)

(Total for Question 26 = 15 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 80 MARKS

